

APPENDIX I

Preliminary Pipeline Assessment

*Preliminary assessment prepared by Carollo
Engineers, August 2001.*

*Technical memorandum and map prepared by
IDModeling, Inc., April 2010*

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received
8/17/01

DRAFT

Poseidon Resources Corporation
Orange County Desalination Project
**PRELIMINARY ASSESSMENT OF
POTENTIAL WATER TRANSMISSION LINE
ROUTES FOR THE ORANGE COUNTY
DESALINATION PLANT
TO THE OC-44 IN COSTA MESA**

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ORANGE COUNTY DESALINATION PROJECT**

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PRELIMINARY ASSESSMENT OF POTENTIAL WATER TRANSMISSION LINE ROUTES FOR THE ORANGE COUNTY DESALINATION PLANT TO THE OC-44 IN COSTA MESA

1.1 INTRODUCTION

The objective of this work was to conduct preliminary investigations to determine the feasibility of routing a 42 to 48-inch force main from the proposed Orange County Desalination Plant to the 42-inch diameter reach, or segment, of the OC-44 water transmission line in the City of Costa Mesa, California. This proposed connection would allow for the conveyance of high-quality potable water through the OC-44 and, eventually, to south Orange County where water demand is high and alternative sources of water are limited. To determine a feasible route, preliminary meetings were held with the cities of Huntington Beach and Costa Mesa, California to address potential problems with the various routes proposed.

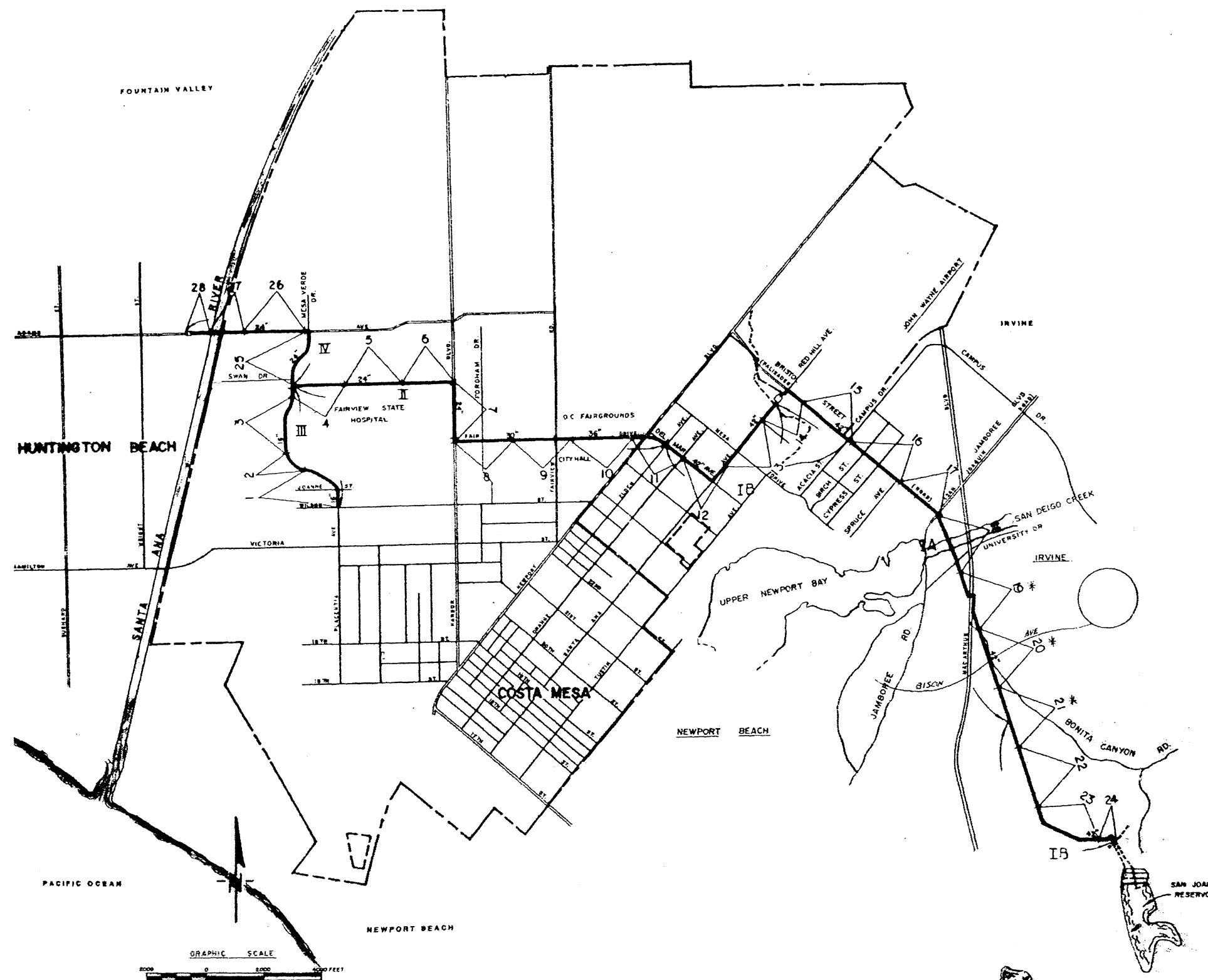
The information presented below is based on limited technical evaluation of pipeline routes. This preliminary assessment was conducted for the purposes of providing information for an Environmental Impact Report only.

1.2 OC-44 TRANSMISSION LINE

The OC-44 transmission line was designed to transfer water from the San Joaquin Reservoir through the eastern limits of the City of Costa Mesa, with turnouts along the route, terminating near the southeastern edge of Huntington Beach. Because the San Joaquin Reservoir is no longer in service, the MWD potable water supply to the OC-44 is now directly off the East Orange County Feeder (EOCF) #2 only. Figure 1 shows the location of the OC-44 transmission line and its associated size at each junction. As shown, the western reaches of the transmission line are of limited capacity (24 and 16-inch) while the eastern reaches are more sizable (42-inch). Under the objectives of this work the flow of the water in OC-44 would be reversed. Thus, the latter reach would be tied into a new 42-inch transmission line, which would be routed from the Orange County Desalination Plant in order to accommodate the projected 50 mgd of potable water produced at the plant. Currently, as shown in Figure 1, the 42-inch reach of the OC-44 is located just east of the 55 Freeway on Del Mar Street in the City of Costa Mesa.

Joint ownership of the OC-44 transmission line between the City of Huntington Beach and Mesa Consolidated Water District (MCWD) exists. A meeting was held with MCWD on May 10, 2001 to provide updated information on the Poseidon SWRO project and identify any potential issues regarding conflicting future uses for the OC-44 line. Similarly, a meeting with the City of Huntington Beach was held on April 10, 2001 to address future uses of the OC-44 transmission line.

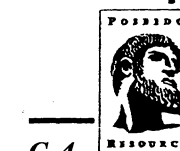
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OC-44 TRANSMISSION LINE

FIGURE 1

POSEIDON RESOURCES



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1.3 DESCRIPTION OF PROPOSED ROUTES

As shown in Figure 2, three proposed routes were devised as a means to convey potable water from the proposed Orange County Desalination Plant to the 42-inch reach of the OC-44 in Costa Mesa. A primary and two alternative routes were proposed. The following sections describe these routes in detail. The routes are divided into reaches for clarity.

1.3.1 Primary Route

An initial northern, or primary, route was proposed. This route (shown in blue on Figure 2) is from the proposed desalination plant at the AES power generation facility north along Brookhurst to Adams and then southeast to the OC-44 connection on Del Mar. The overall length of this route is approximately 40,050 feet. For discussion it has been broken down into the following five reaches:

1. Primary Route, Reach 1

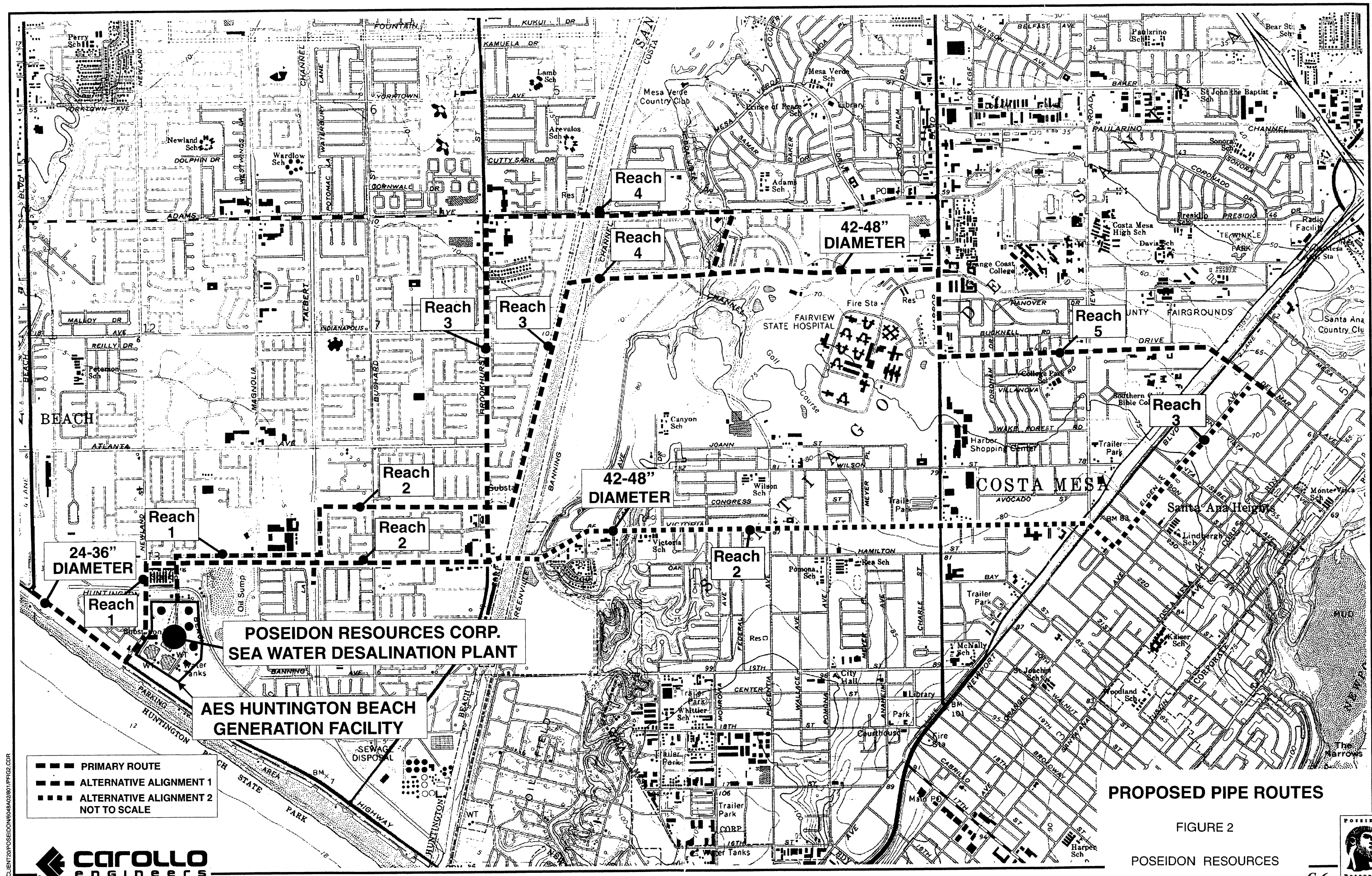
The initial reach of the new force main would leave the AES site on the east side of Newland Avenue and proceed north to Hamilton. Approximately two-thirds north along this reach, the pipeline would have to cross a flood control channel at Newland, which would require the trenchless construction or tunneling of the pipeline underneath the drainage channel. The bridge crossing the channel is currently of limited capacity and could not receive a pipe of this size, leaving micro-tunneling, or directional boring as the only viable alternatives.

2. Primary Route, Reach 2

Reach 2 would begin at the intersection of Newland and Hamilton and proceed east along Hamilton to the intersection of Hamilton and Brookhurst. Before crossing the Talbert drainage channel, this route would pass south of the Edison High School in Huntington Beach. Passage under the Talbert drainage channel would require trenchless methods. Traffic flow along this section of Hamilton is currently low to moderate with two lanes along the western reach and expanding to four lanes east of Magnolia.

An abandoned 30-inch pipe previously owned by the Orange County Water District exists along Reaches 1 and 2 (up to the Talbert Channel). This pipe would be removed and replaced by the larger SWRO product pipe. A turn out would be provided near the Talbert channel to connect to an existing 30-inch pipeline conveying groundwater to Newport Beach. There may be a possibility of encountering contaminated soils near the western end of Reach 2, where the reach passes near an oil sump area. Traffic flow is heavy, as Brookhurst is a major north-south corridor in the City of Huntington Beach. Brookhurst currently is a six-lane road through primarily residential areas.

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3. Primary Route, Reach 3

Reach 3 would begin at the intersection of Hamilton and Brookhurst and proceed north along Brookhurst to the intersection of Brookhurst and Adams. There are no major intersections along this route, so open trench construction is acceptable. Traffic flow is heavy, as Brookhurst is a major north-south corridor in the City of Huntington Beach. Brookhurst is a six-lane road through primarily residential areas.

4. Primary Route, Reach 4

Reach 4 would begin at the intersection of Brookhurst and Adams and proceed east along Adams to Placentia. At Placentia, the pipeline would turn south, running along Placentia to the Costa Mesa Country Club/golf course at which point the route would proceed east along the northern boundary of the park to Harbor Boulevard. Finally, Reach 4 would run south along the eastern edge of the park (parallel to Harbor) to the intersection of Harbor and Fairview.

Approximately halfway along Adams, the proposed pipe route would have to cross the Santa Ana River and Greenville-Banning Channel. This is a significant crossing of greater than 600 feet. This crossing would require trenchless construction underneath the river and channel as the current bridge crossing at Adams could not support a 42 to 48-inch pipe. Minimal space at this intersection is available for required trenchless construction. In addition, traffic flow along Adams is heavy during rush hour periods. Adams is a six-lane road at this location.

The remaining roadway portions of Reach 4 would include a short stretch along Placentia (approximately 1,500 feet). East of Placentia, the primary route would follow the Costa Mesa Country Club where off-pavement open trenching construction would be possible. The pipeline would pass north of Fairview State Hospital within the northeast corner of the park.

5. Primary Route, Reach 5

Reach 5 of the Primary Route would begin at the intersection of Harbor and Fair and terminate at the OC-44 connection point at the intersection of Del Mar and Orange.

Crossing Harbor Boulevard at Fair from the eastern boundary of Fairview Park would most likely require trenchless construction. Harbor is currently a major north-south corridor and is usually quite congested with a total of six lanes of traffic.

Routing of the pipeline on the north side of Fair would permit the construction of the line off-pavement once the Orange County Fairgrounds is reached. Before reaching the fairgrounds the route passes north of College Park School. East of the fairgrounds, pipeline construction would encounter the 55 Freeway and require trenchless construction underneath this major crossing (approximately 500 to 600 feet). Beyond the 55 Freeway, the pipeline runs along Del Mar street for about 1,200 feet to the connection with the OC-44. Del Mar is a low traffic flow street in residential areas.

1.3.2 Alternative Alignment 1

A first alternative route (Figure 2, Alternative Alignment 1 - black) was proposed, which would traverse along a southern route to the OC-44. This route would rely entirely on the construction of the force main within public easements, through the cities of Huntington Beach and Costa Mesa. The overall distance for this route would be approximately 30,000 feet and has been divided into the three following reaches for discussion:

1. Alternative Alignment 1, Reach 1

The first reach of the first proposed route would follow Reach 1 and 2 of the primary route.

2. Alternative Alignment 1, Reach 2

Reach 2 of the Alternative Alignment 1 would begin at the intersection of Hamilton and Brookhurst in the City of Huntington Beach and traverse the Santa Ana River east along Victoria to the 55 Freeway.

As with the crossing at the Santa Ana River along Adams, the crossing along Victoria would require trenchless construction due to a limitation in bridge capacity there. It is important to note that this area is quite congested and limited space is available for trenchless construction. Victoria Boulevard is currently a main thoroughfare between the cities of Huntington Beach and Costa Mesa and experiences heavy traffic flow. Victoria is a four-lane road in the area concerned.

Reach 2 would run parallel to Victoria School, which may require special conditions for construction and traffic control. Further to the east the reach would pass to the south of Wilson School and to the north of two other schools (Pomona and Rea). At the intersection of Victoria and Harbor Boulevard, trenchless construction would be required by the City of Costa Mesa as the Harbor-Victoria intersection can be extremely congested. Further trenchless construction would be required to cross the 55 Freeway. At this crossing, more land area is available for trenchless construction than is available for the northern route crossings of the 55 Freeway.

3. Alternative Alignment 1, Reach 3

The third and final reach of the second alternative route would begin at the eastern edge of the 55 Freeway and progress a few hundred feet down 22nd Street until turning northeast along Elden to the OC-44 connection point. This reach would be along minor residential streets with no trenchless construction required.

1.3.3 Alternative Alignment 2

The second alternative route proposed (Figure 2, Alternative Alignment 2 - green) was a second northern route, which would progress from the proposed desalination plant north along the Santa Ana River. Eventually, this route would run east through the Costa Mesa Country Club until it would join the proposed Primary Route at Placentia and the northern

park boundary. The length of this proposed route would be approximately 34,450 feet. This alternative route through the City of Huntington Beach would traverse through Southern California Edison (SCE) transmission line easements, allowing for greater off-pavement construction. This route was divided into the following four reaches:

1. Alternative Alignment 2, Reach 1

The initial reach of the first alternative route would run north from the proposed desalination plant at the AES site along SCE easements to an easement area running east and parallel to the northern edge of Hamilton Street. In this section of the reach the pipe could replace the existing abandoned 30-inch pipe, described above. After traversing east through the easement for approximately 3,300 feet, the force main would have to be routed under the Talbert drainage channel using trenchless construction methods to an easement area (Edison Park) running north-south on the eastern edge of the channel.

The SCE easement area running west to east along Hamilton between Newland and the Talbert Channel passes directly south and parallel to the Edison High School. This area is a landscaped park as is the north-south easement parallel to the Talbert Channel, the latter area comprising Edison Park.

2. Alternative Alignment 2, Reach 2

Reach 2 of the Alternative Alignment 2 route would begin at the northern end of Edison Park (parallel to the Talbert Channel) and run east to the Santa Ana River between Atlanta and Hamilton. This reach would run through undeveloped landscape within the SCE easement except for a small nursery east of the Talbert Channel. Within this zone trenchless construction would be required to pass under Brookhurst and possibly Bushard.

3. Alternative Alignment 2, Reach 3

Reach 3 of the Alternative Alignment 2 route would run north-northeast along the Santa Ana River within SCE easement areas. This reach would traverse north from the previous easement area between Atlanta and Hamilton to the northern edge of the Costa Mesa Country Club on the western slope of the Santa Ana River. As with Reach 2, this stretch is essentially undeveloped land except for a small nursery at the terminus of Atlanta Avenue. Open trenching is acceptable within this reach.

4. Alternative Alignment 2, Reach 4

Reach 4 of the second alternative route would pass underneath the Santa Ana River and Greenville-Banning Channel and continue east along the northern boundary of the Costa Mesa Country Club. At Placentia, this alternative route would become the same as that for the Primary Route, described above as Reach 4 (western portion) and 5. Within this proposed route, the crossing of the Santa Ana River would offer more space for trenchless construction than the primary route at Adams for the 600+ foot crossing.

1.4 CITY MEETINGS

Meetings were held with municipalities located along the OC-44 transmission line and those municipalities having a vested interest in any OC-44 operational changes, affecting the supply of MWD water. The cities of Huntington Beach and Costa Mesa were contacted as new pipeline construction through these cities could cause disturbance to residents, primarily through the impact of construction in streets on traffic flow. The proposed pipe routes, primary and alternate, were ultimately decided upon following direct communication with municipal engineers. Similarly, SCE was contacted regarding the routing of a pipeline through SCE easement areas. Ms. Alice Likely with the SCE R/W department was the point-of-contact for these discussions. Ultimately, communication with the cities and SCE led to the development of three potential routes (two northern and one southern) as shown in Figure 2.

1.4.1 City of Huntington Beach

A meeting with the City of Huntington Beach was held on April 10, 2001. In this meeting, an initial northern and southern route was presented to the City by Carollo Engineers. The southern route, shown in Figure 2 (Alternative Alignment 1), remained the same from initial conception although an additional northern route (Alternative Alignment 2) was later added as a result of discussion with the City of Huntington Beach, Costa Mesa, and SCE. Initially, the northern route was proposed to traverse north along Brookhurst Ave, east along Adams, and then to Placentia to join the existing OC-44 line (Figure 2, Primary Route). Though there are no current street moratoriums on any of the routes, the City preferred the southern route along Hamilton Boulevard. It was argued by the City that the northern or primary route would greatly disrupt traffic and may conflict with any future pipe corridors.

Later discussions with the City of Costa Mesa made it clear that the City prefers the northern pipe route for reasons that will be discussed shortly. Consequently, a new alternative, northern route was investigated that would mitigate concerns posed by the City of Huntington Beach. This new northern route entailed the construction of the 42 to 48-inch main within the Southern California Edison (SCE) high voltage transmission power line corridor through the City of Huntington Beach. As shown in Figure 2 (Alternative Alignment 2), this route would virtually eliminate the need for construction within Huntington Beach city streets, resulting in cost savings and less disruption to the City.

Conversations with Mr. Matthew Lamb of the City's Real Estate Services gave valuable information concerning the routing of pipe within SCE easement areas. Overall, the City found this route more favorable than any options previously presented. The following stipulations/recommendations were made concerning construction within Huntington Beach park areas and SCE easement zones:

- If constructed in SCE easements, an agreement would have to be entered into between the pipe owner and SCE, most likely a non-exclusive easement, or a non-cancelable lease. The cost to obtain a non-exclusive lease would roughly be equal to the 30 percent of the pipeline area within the Edison easement times \$18 to \$20.
- The City of Huntington Beach would have to approve the chosen route.

- Construction within parks would have limits for overall trenching length (300 to 500 feet) and total lay-down area. Limited storage of equipment would be allowed within parks.
- The replacement of sod, trees, or any other disturbed structures or vegetation in park areas would be requested.
- Some negotiations would be required to pass through nurseries located along the pipe route, primarily the nursery located south of the Santa Ana river crossing at the end of Atlanta Avenue.
- The City of Huntington Beach would require that some street crossings, such as Bushard or Brookhurst, involve trenchless construction (6 feet below pipe crest elevation) to allow for future expansion and construction of City utility systems.
- Acceptance of construction in park areas by the public is often aided through the donation of some type of park property (i.e., children's playground equipment).

The northern pipe route would follow SCE transmission lines, through some park areas. The initial reaches of the force main would have to run through a parkway south of Edison High School on Hamilton, cross under the Talbert channel, and then run north through Edison Park as shown in Figure 2.

It became apparent that a clear advantage of routing a water main of this dimension under power transmission lines was that easement areas would provide more space for pipe trenchless construction. This was an important issue when considering the future crossing of the Santa Ana River, south of Adams. Routing the pipeline under the river along the northern boundary of Fairview Park in Costa Mesa would require considerable area to be available for trenchless construction.

Conversations with Alice likely of SCE revealed that recent events within the power industry in California have prevented the issuing of non-exclusive easements by SCE. Consequently, despite the benefits associated with routing of pipes through SCE easement areas, this option should be treated as an alternative, not a primary route.

1.4.2 City of Costa Mesa

A meeting with the City of Costa Mesa took place on April 11, 2001. The initial pipe routes that were presented to the City of Huntington Beach were also presented to the City of Costa Mesa. Initially, Costa Mesa accepted the southern pipe route, as this route was preferred, and requested by the City of Huntington Beach and Carollo. However, upon review of a routing map provided to the City by Carollo, the City reversed its stance in favor of the northern route. The reasons given by the City of Costa Mesa for their preference in using a northern route were the following:

- Construction of the pipeline along the northern route would provide the least disturbance to the residents in the City of Costa Mesa through significantly less street trenching and, hence, less impact on traffic.
- Off-street trenching would be possible all along the northern and eastern boundary of Fairview Park and the Costa Mesa Golf Course.

- Off-street trenching would be possible along the southern boundary of the Orange County Fairgrounds.

The routing of the new 42 to 48-inch force main in Costa Mesa would run along side of the existing smaller diameter reaches of the OC-44 in the City of Costa Mesa beginning at Fairview Park. The original pipeline will be left in place as to allow continued use by Mesa Consolidated and proposed use by the Orange County Water District for barrier injection water supply.

1.4.3 Southern California Edison

Given the benefits of routing the proposed pipeline through SCE easements, SCE was contacted to inquire about the possibility of obtaining non-exclusive easements for pipeline construction. A phone conversation on June 5, 2001 with Alice Likely of SCE revealed that there was some uncertainty of obtaining easements from SCE due to the California energy crisis. Routing maps were sent to SCE for review. However, in a letter dated June 21, 2001 from SCE, it was stated that "Edison is not in a position to allow the proposed facilities to be placed within it's rights of way because they will interfere with any future expansion of Edison's facilities." Even given this response, future granting of easements may be possible if the California energy crisis is resolved and SCE becomes once again financially viable.

1.5 CALTRANS AND COUNTY OF ORANGE

The construction of a new 42 to 48-inch line will require crossing the Santa Ana River and the 55 Freeway, both major crossings, constituting considerable lateral traverses.

Though CalTrans could not be contacted concerning the trenchless construction under the 55 Freeway, it is believed that CalTrans should not impede the construction of new water main. Past construction projects by Carollo have passed under major roadways similar to the 55 Freeway with little difficulty.

The crossing of the Santa Ana River will require communication and coordination with the County of Orange. Prior to pipeline construction, an encroachment permit would be required by the county. In addition, a 30-day review period of construction plans would eventually have to pass acceptance with the county before construction could begin. All pertinent information would be forwarded by the county and other appropriate agencies.

1.6 PIPELINE CONSTRUCTION

The majority of pipe work in the proposed northern route would consist of open trench construction. The crossing of major streets, the Santa Ana River, drainage canals, and the 55 Freeway would all involve trenchless construction methods. Table 1 summarizes the estimated lengths of trenching and the number of probable trenchless construction locations required for each proposed route.

| Table 1 Construction Details Orange County Desalination Project Poseidon Resources Corporation | | | |
|--------------------------------------------------------------------------------------------------------------------|-----------------------------|--------------------------------|--------------------------------------------|
| Route | Open Trench [ft] | Under Pavement [ft] | No. of Trenchless Constructions |
| Primary Route | 10,700 | 29,350 | 6 |
| Alternative Alignment 1 | 0 | 30,000 | 6 |
| Alternative Alignment 2 | 30,150 | 4,300 | 5 |

Figure 3 illustrates the various construction techniques that would be utilized to route the 42 to 48-inch water main.

For open trenching, the minimum covering for a 42 to 48-inch pipe would be at least 5 to 6 feet with 2 feet of available workspace on both sides of the pipe. This would require deep trenches (approximately 9 to 10 feet) with appropriate shoring. It is expected that, at this depth, dewatering would be required in regions close to the ocean in Huntington Beach – especially near the AES site. Including required lay-down area for supplies and equipment, a 30-foot easement may be required on trenching operations, often resulting in the shut-down of at least two lanes of traffic on most streets. If this area were not available, equipment and materials would have to be transported in and out of the construction area.

In the event that contaminated soils are found in any trenching areas, proper care would require the covering, transportation, and disposal of contaminated soils to licensed landfills. Otherwise, soils would have to be treated off site. While, it is not expected that contaminated soils will be encountered within City rights-of-way, contaminated soils may be possible near or around the AES site given the history of this area.

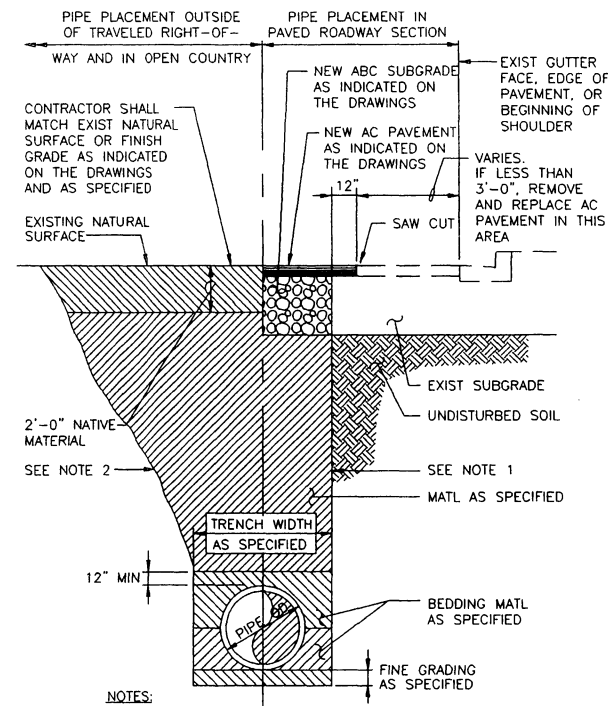
For a pipe diameter of this size, the required size of any access construction pit would be a minimum 20 feet by 30 feet and 15 feet by 15 feet for receiving pits. Due to the probable depth and size of this pit, shoring would be required.

1.7 PRELIMINARY ROUTING PREFERENCE

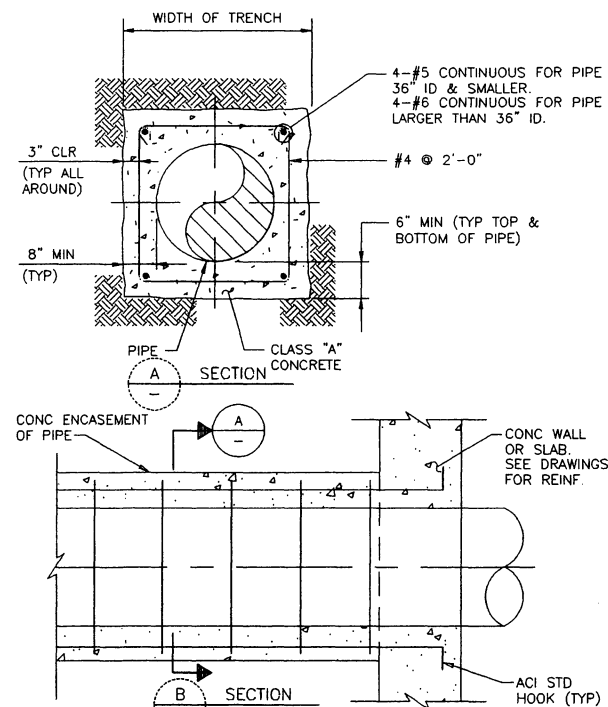
Although the northern piping route was initially considered as an alternate route, discussions with the cities of Costa Mesa and Huntington Beach led to the conclusion that this particular route would be the currently preferred option now that routing is not possible in SCE easements. Even though the northern route necessitates the use of more linear feet of pipeline as shown in Figure 2, this decision was based on the following list of benefits:

- The northern route entails significantly less construction within streets in Costa Mesa. The proposed southern route traverses streets in Costa Mesa that are more heavily congested. Construction would lead to greater problems in traffic control for the southern route.
- Much greater area for trenching in parks areas in the City of Costa Mesa is available.

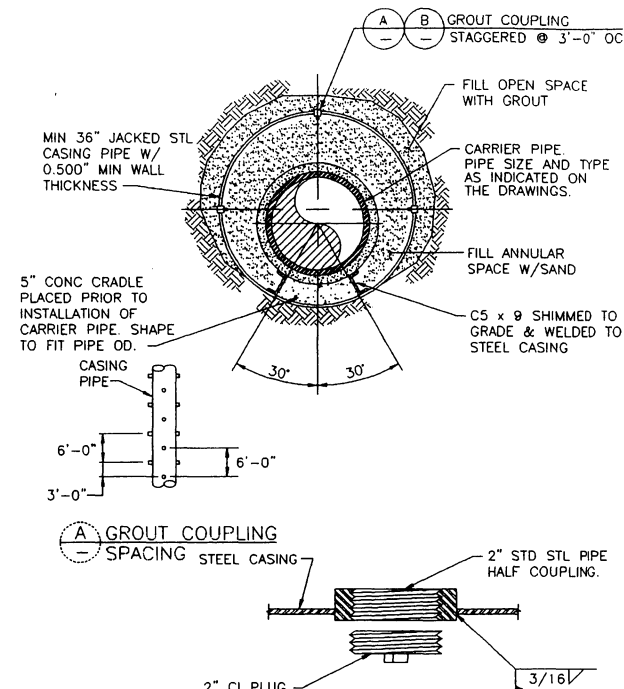
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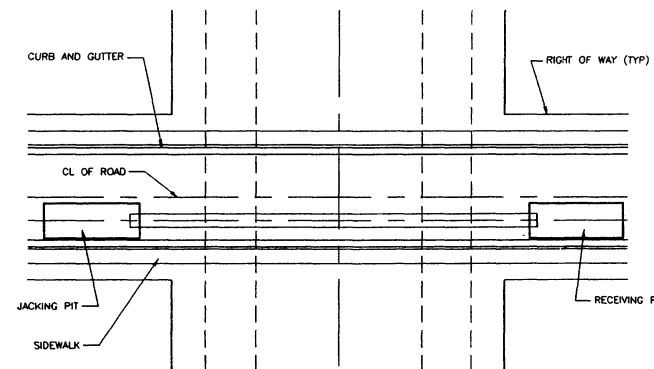
P002 PIPE INSTALLATION AND PAVEMENT REPLACEMENT
TYP



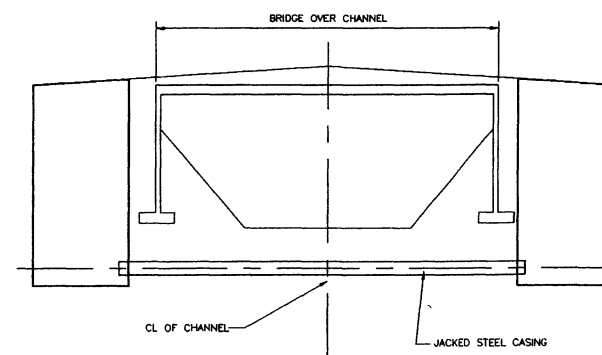
P040 CONCRETE ENCASEMENT OF PIPE
TYP



P032 PIPE IN JACKED STEEL CASING
TYP

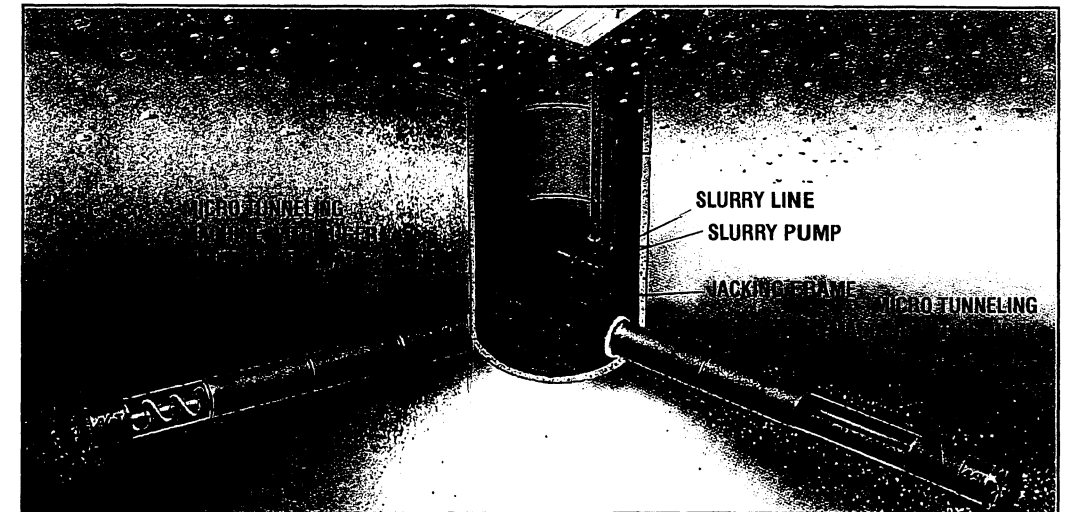


PLAN

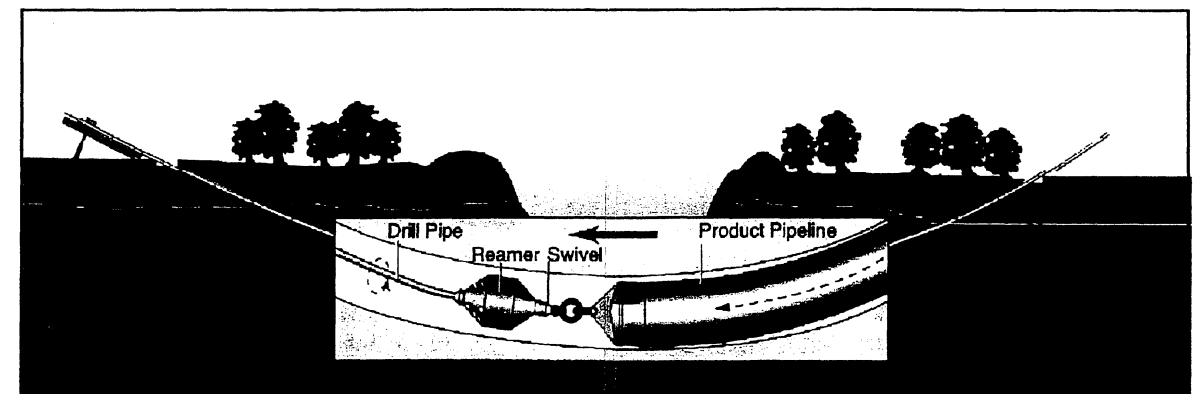


SECTION

A TYPICAL PIPE CASING JACKING
NOT TO SCALE



MICRO TUNNELING



HORIZONTAL DIRECTIONAL DRILLING

PIPELINE CONSTRUCTION

FIGURE 3

POSEIDON RESOURCES



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DRAFT TECHNICAL MEMORANDUM

Feasibility Study to Provide Desalinated Water Supplies to Huntington Beach and the West Orange County Water Board Feeder Pipelines

PREPARED FOR: Poseidon Resources Corporation
PREPARED BY: IDModeling, Inc.
DATE: December 16, 2009, revised April 30, 2010

General Background

A seawater desalination facility in the City of Huntington Beach (Huntington Beach) is proposed to provide water to cities and water agencies in Orange County, California. The objective of this project was to perform a feasibility study on the use of existing transmission pipelines (owned and operated by Huntington Beach) to convey water through Huntington Beach to meet demands within Huntington Beach and north of Huntington Beach along the existing West Orange County Water Board Feeder (WOCWBF) No. 2 Pipeline. The goal of this feasibility study was to determine if it is feasible to convey desalinated seawater through these pipelines and, if so, to determine the reasonable capacity that could be conveyed.

The WOCWBFs No. 1 and No. 2 supply water to Huntington Beach, Garden Grove, Westminster, and Seal Beach. Currently, water is supplied to these pipelines from the West Orange County Feeder (WOCF), which is owned and operated by the Metropolitan Water District of Southern California (MWD). This study examines the feasibility of replacing some or all of the MWD supplies in the WOCWBF pipelines. This study does not propose to have desalinated water enter the WOCF.

Existing Transmission Facilities

Huntington Beach receives imported supplies through connections with MWD. Three of these connections include: OC-9, OC-35 and OC-44. The OC-9 and OC-35 connections receive supplies from the WOCF. The OC-44 connection receives water from the East Orange County Feeder No. 2 (EOCF#2). The OC-44 connection is located near the San Joaquin Reservoir and the connection is at the south end of the EOCF#2. Since all three of these connections are outside of the service area for Huntington Beach, imported supplies are conveyed to Huntington Beach through transmission mains. A brief description of each of these pipelines follows. Figure 1 presents the locations of these connections and the transmission pipelines that connect to the Huntington Beach water system.

West Orange County Water Board Feeder No. 1

The WOCWBF#1 supplies imported MWD water to two water agencies through the OC-9 connection to the WOCF. Connections along the WOCWBF#1 provide water

to the City of Westminster. At the end of the pipeline, Huntington Beach has a connection where it reduces the pressure to about 80 pounds per square inch (psi) and allows the water to flow into another transmission main, referred to in this study as the HB OC-9 pipeline, which is owned and operated exclusively by Huntington Beach. The contractual capacity within the OC-9 connection and WOCWBF#1 pipeline for HB is 14 cubic feet per second (cfs), which is approximately 9.0 million gallons per day (MGD).

West Orange County Water Board Feeder No. 2

The WOCWBF#2 supplies imported MWD water to four water agencies through the OC-35 connection to the WOCF. Connections along the WOCWBF#2 provide water to the cities of Garden Grove, Seal Beach, and Westminster. At the end of the pipeline, Huntington Beach has a connection where it reduces the pressure to about 80 psi and allows the water to flow into another transmission main, referred to in this study as the HB OC-35 pipeline, which is owned and operated exclusively by Huntington Beach. Huntington Beach's contractual capacity within the OC-35 connection and the WOCWBF#2 pipeline is 20 cfs (13 MGD). At the southern end of the WOCWBF#2, Huntington Beach also has a pumping station that can be used to increase the pressure of the water it receives. This station is used to meet peak demands and for fire protection within the HB system .only used when the pressure in the WOCWBF#2 is lower than the pressure needed by Huntington Beach's distribution system.

OC-44 Pipeline

The OC-44 Pipeline supplies imported MWD water to two water agencies through the OC-44 connection to the EOCF#2. Connections along the OC-44 Pipeline provide water to the Mesa Consolidated Water District. At the end of the pipeline, Huntington Beach has a connection where it reduces the pressure to about 86 psi and allows the water to flow into another transmission main, referred to in this study as the HB OC-44 pipeline, which is owned and operated exclusively by Huntington Beach. Huntington Beach's contractual capacity within the OC-44 connection and the OC-44 Pipeline is 15 cfs (9.7 MGD).

Analysis Assumptions

The assumptions made during the analysis include the following:

1. Total supply from the proposed desalination plant is 50 MGD, which is approximately 77 cfs.
2. The surface water elevation of the desalination plant clear well reservoir is 10 ft-msl.
3. The existing minimum pressure within the OC-44 Pipeline is 150 psi.
4. The maximum hydraulic grade line downstream of the Coastal Junction pressure regulating station is 485 ft-msl. This was identified in a prior study as an MWD requirement to protect the Irvine Cross Feeder.
5. The minimum pressure downstream of the Huntington Beach pressure regulating stations at the southern end of the WOCWBF#1 and WOCWBF#2 pipelines is 80 psi.

6. Demands on the EOCF#2 are based on projected water demands obtained from MWDOC.
7. Demands for Huntington Beach, Garden Grove, Seal Beach, and Westminster are based on their respective existing capacity in the OC-9 and OC-35 connections and the WOCWBF#1 and WOCWBF#2 pipelines.
8. The maximum velocity in the existing Huntington Beach transmission pipelines was assumed to be 7 feet per second (fps).
9. Huntington Beach requires a minimum pressure of 80 psi downstream of the pressure regulating stations that feed water to the HB OC-9 and HB OC-35 pipelines and a minimum pressure of 86 psi on the downstream side of the pressure regulating station at the end of the OC-44 Pipeline.

Hydraulic Analysis

The existing hydraulic computer model (developed as part of prior studies) was used for this study to determine the hydraulic capacity of the existing Huntington Beach transmission pipelines to provide adequate pressure and flow from the proposed desalination facility to Huntington Beach, Garden Grove, Seal Beach and Westminster. For this study, the following facilities were added to the model:

- OC-9 connection and the WOCWBF#1 pipeline
- OC-35 connection and the WOCWBF#2 pipeline
- Pipelines in Huntington Beach that include: HB OC-9, HB OC-35, and HB OC-44

The water from the proposed desalination facility is proposed to supply water to Huntington Beach through two connections. The locations of the proposed connections include:

- Proposed Connection No. 1 – Located adjacent to the proposed desalination plant.
- Proposed Connection No. 2 – Located at Adams Avenue and Brookhurst Street. Note that this is an existing connection to Huntington Beach's system, which has an existing capacity of 15 cfs (9.7 MGD). For flows up to 15 cfs, the existing pressure reducing facility should be adequate. For flows above 15 cfs, the existing pressure reducing facility may need to be modified.

The proposed Connection No. 1 would allow Huntington Beach to take 5 cfs directly from the proposed desalination facility. Connection No 2 would supply desalinated seawater to Huntington Beach using the existing HB OC-44 pipeline and distribute desalinated water to the HB OC-09 and HB OC-35 pipelines.

The water demands supplied by the WOCWBF#1, WOCWBF#2, and OC-44 pipelines for the various water agencies are shown in Table 1. Table 2 and Table 3 show the ownership by reach for the WOCWBF#1 and WOCWBF#2 pipelines.

Table 1 – Ownership Capacities for OC-9, OC-35 and OC-44 Connections

| Water Agency | Ownership Capacity (cfs) | | |
|----------------------|--------------------------|-------------|-------------|
| | OC-9 | OC-35 | OC-44 |
| Garden Grove | 0.0 | 5.0 | 0.0 |
| Huntington Beach | 14.0 | 20.0 | 15.0 |
| Mesa Consolidated WD | 0.0 | 0.0 | 52.0 |
| Seal Beach | 0.0 | 10.0 | 0.0 |
| Westminster | 7.0 | 12.0 | 0.0 |
| Totals (cfs) | 21.0 | 47.0 | 67.0 |
| Totals (MGD) | 13.6 | 30.4 | 43.3 |

Table 3 – Ownership by Reach WOCWBF#2

| Reach No. | Garden Grove | | Westminster | | Seal Beach | | Huntington Beach | | Total |
|-----------|--------------|----|-------------|----|------------|----|------------------|-----|-------|
| | cfs | % | cfs | % | cfs | % | cfs | % | |
| 1 | 5 | 11 | 12 | 26 | 10 | 21 | 20 | 43 | 47 |
| 2 | 0 | 0 | 12 | 29 | 10 | 24 | 20 | 48 | 42 |
| 3 | 0 | 0 | 7 | 19 | 10 | 27 | 20 | 54 | 37 |
| 4 | 0 | 0 | 2 | 6 | 10 | 31 | 20 | 63 | 32 |
| 5 | 0 | 0 | 2 | 9 | 0 | 0 | 20 | 91 | 22 |
| 6 | 0 | 0 | 0 | 0 | 0 | 0 | 20 | 100 | 20 |

Simulations were set up to supply water by the proposed desalination facility to meet various demand scenarios.

Table 4 – Simulated Flows for Each Scenario

| Scenario | Flows (MGD) | | | | Total (MGD) |
|----------|----------------------------|-------------------------|--------------------|----------------------|-------------|
| | OC-44 Pipeline to South OC | HB OC-44 Pipeline to HB | WOCWBF#2 Pipelines | HB Directly from PRC | |
| 1 | 43.2 | 3.6 | 0.0 | 3.2 | 50.0 |
| 2 | 32.2 | 14.6 | 0.0 | 3.2 | 50.0 |
| 3 | 24.6 | 22.2 | 0.0 | 3.2 | 50.0 |
| 4 | 24.6 | 22.2 | 17.4 | 3.2 | 50.0 |

Note: Scenarios 3 and 4 represent the extreme flows considered possible in the HB OC-44 pipeline. The actual flows in the HB OC-44 and WOCWBF#2 pipelines will likely be less than those shown.

As shown in Table 4, Scenario 1 is the base scenario used in previous studies to establish the feasibility of supplying desalinated water to offset supplies from the EOCF#2 pipeline. For this study, Scenario 1 was used for comparison purposes. Note that for all scenarios it was assumed that Huntington Beach would take 5.0 cfs (3.2 MGD) from a location adjacent to the proposed desalination plant.

Scenarios 2 and 3 analyzed two demand scenarios to supply water to Huntington Beach. The higher flow rate assumes a maximum velocity of 7 fps in the existing 30-inch HB OC-44 pipeline.

The last scenario simulates supplying water demands to cities north of Huntington Beach that are currently supplied by the WOCWBF#2 pipeline. These agencies include the cities of Garden Grove, Seal Beach and Westminster. This scenario uses the same pipelines as Scenarios 2 and 3, but this scenario requires a pumping

station to pump the water from the HB OC-35 pipeline into the WOCWBF#2 pipeline. To consider the maximum flow rate and total dynamic head requirements, it was assumed that Huntington Beach was not taking any desalinated water.

Required Improvements

Improvements needed to allow desalinated seawater to replace supplies from the EOCF#2 have been addressed in previous studies. Therefore, this study focused on improvements needed to facilitate the use of desalinated seawater to replace supplies from the OC-9 and OC-35 connections.

Improvements needed to supply desalinated water to Huntington Beach will require the following facilities:

- A flow control station may be required to replace the existing station at the western end of the OC-44 Pipeline. The existing station may not have sufficient capacity for the increased flow rates that are proposed in this study. The existing station has an existing capacity of 15 cfs (9.7 MGD). Flows above this capacity may require station upgrades. The increased pressure to this station may also require station upgrades.
- Pressure reducing valves located along the transmission mains to regulate the pressure entering Huntington Beach's system. Pressures in the transmission pipelines near the desalination facility will see higher pressures than the current pressures. The existing normal operating pressure in the HB OC-44 pipeline is about 86 psi and this could increase to about 130 psi. To protect the distribution system from these higher pressures, pressure regulating valves are proposed along the HB OC-44, HB OC-9 and HB OC-35 pipelines.

Improvements needed to supply desalinated water to Huntington Beach, Garden Grove, Seal Beach, and Westminster will require the following additional facilities:

- Modifications to Huntington Beach's existing pumping station located at the pressure regulating station along the OC-35 pipeline – The station will need to be modified to allow it to be used to pump water from the southern side of the station to the northern side. This will result in reverse flow in the existing pipeline. The maximum capacity of this station will be about 27.0 cfs (17.4 MGD) with a total dynamic head of about 190 feet. The actual pumping head required will depend on the pressure requirements by the respective agencies connected to the OC-35 pipeline.

Results

The model results indicate that it is hydraulically feasible to supply water to the Huntington Beach transmission mains from the proposed desalination plant. The existing Huntington Beach transmission pipelines have adequate hydraulic capacity to meet the various demand scenarios analyzed in this study, which limited the velocity in these pipelines to 7 fps.

The simulations included demands for Huntington Beach that equaled their capacity from the OC-9 and OC-35 connections and the projected demands for the OC-44 Pipeline. The total demands into Huntington Beach's system were estimated to be about 39.5 cfs (25.5 MGD). However, this flow rate results in a velocity of about 8 fps in the existing 30-inch diameter OC-44 pipeline. Given the velocity limitation

discussed earlier of 7 fps, the maximum flow rate that can be supplied through this pipeline is about 34.4 cfs (22.2 MGD). Therefore, flows through the OC-44 pipeline in Huntington Beach were limited to 34.4 cfs (22.2 MGD).

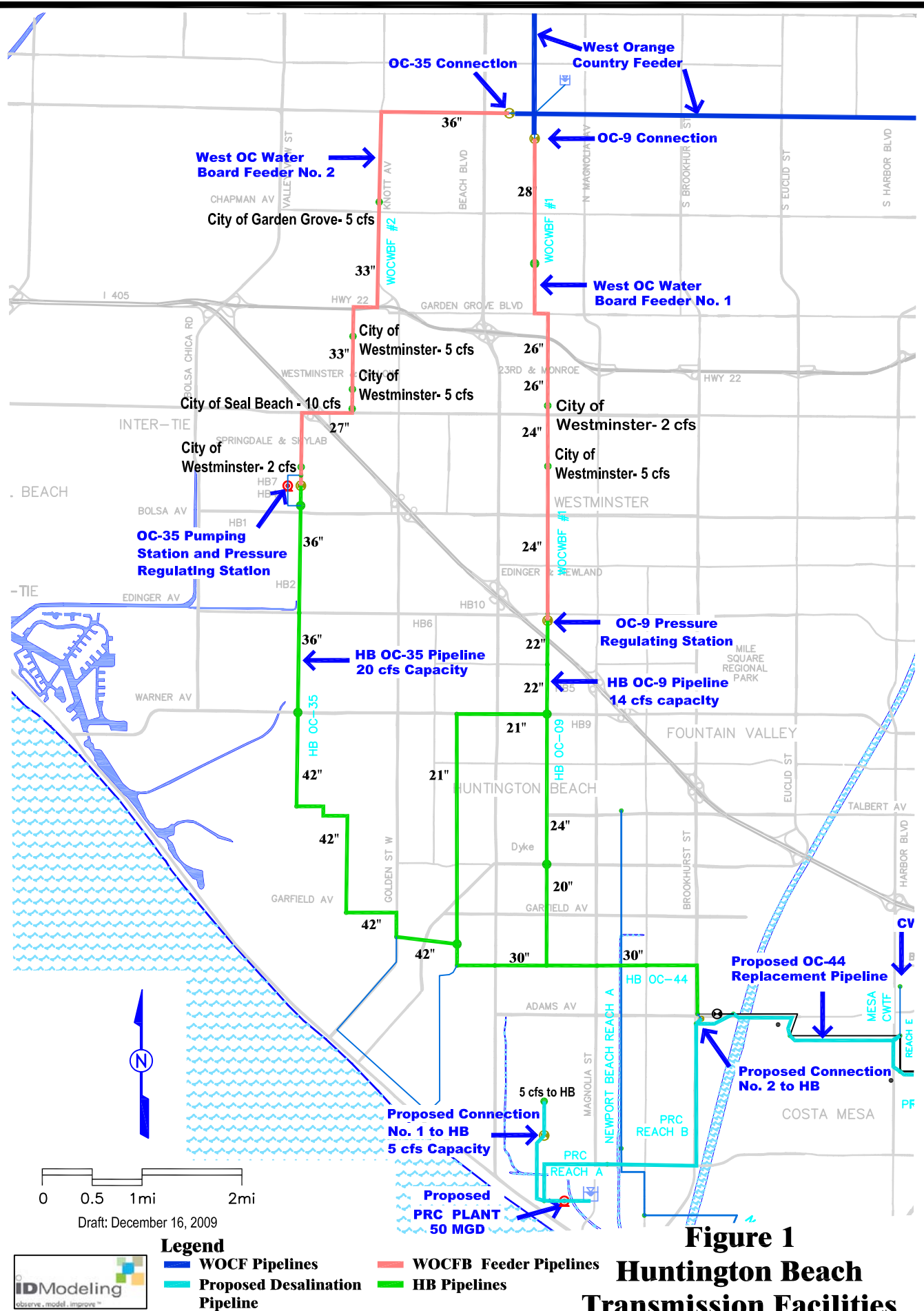
With a supply rate from the desalination facility to Huntington Beach of 34.4 cfs (22.2 MGD), the model results indicate that the minimum pressure of 80 psi can be maintained at the north end of the WOCWBF#1 and WOCWBF#2 pipelines. This will require higher pressures in the transmission pipelines near the desalination facility compared to existing pressures. The existing pressure at the OC-44 pressure regulating station is about 86 psi and the proposed pressure will increase to about 130 psi.

An additional simulation was performed to determine if desalinated supplies could be provided to agencies along the WOCWBF#2 (north of the pressure regulating station on the HB OC-35 pipeline). However, as noted previously, due to velocity limitations, the maximum supply was limited to 34.4 cfs (22.2 MGD). The existing capacities within the WOCWBF#2 pipeline total 27 cfs (17.4 MGD). Since the existing capacity is less than the maximum, it was assumed that there could be demands added to this pipeline at some point in the future (note: the feasibility of this assumption was not verified as part of this study). To supply water to the north of the pressure regulating station on the HB OC-35 pipeline, modifications to Huntington Beach's existing pumping station would be required. The model reported the pumping station should be sized for a capacity of 12,100 gpm (17.4 MGD, 27.0 cfs) and a total dynamic head (TDH) of 190 feet. The model indicated that the minimum pressure at the point where Huntington Beach receives water from the desalination plant is about 130 psi, which provides a pressure to the southern side of the pressure regulating station on the HB OC-35 pipeline of 80 psi.

Summary of Findings

This study has determined that the proposed use of water supplies from the proposed desalination plant in Huntington Beach using existing transmission pipelines is hydraulically feasible. However, more detailed studies are recommended prior to beginning any design related activities to verify assumptions and results from this study. The hydraulic analysis results indicate that a flow rate of up to 34.4 cfs (22.2 MGD) to Huntington Beach is feasible using mainly existing system facilities. Some additional improvements are required to regulate pressures into Huntington Beach's transmission and distribution systems.

To convey the desalinated water north of Huntington Beach to serve Garden Grove, Seal Beach and Westminster, the use of the OC-35 pipeline was analyzed and considered feasible. Modifications to the existing pumping station will be required for this scenario. The pressures for this scenario are not excessive and meet Huntington Beach's minimum requirements on the southern side of the pressure regulating stations on the HB OC-9 and HB OC-35 pipelines.



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